

Towards a Universal Component Schema

*IRMIS/Relational Database Workshop
Argonne National Laboratory
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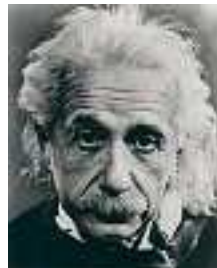


Device Databases

- **Most accelerators have an established ‘device’ database, often representing a significant investment.**
- **These ‘device’ schema(s) are typically designed and implemented from an accelerator physics perspective:**
 - this influences the naming convention. (*What about an ‘operations’ perspective/naming convention? a control system engineer perspective?*)
 - devices are typically abstracted* according to the overall facility goal (light source, heavy ion collider, etc), and thus take on a site specific signature.
 - the site specific nature of each device description/abstraction leads to difficulties in re-use in other facilities
- **Traditionally, there has been difficult to re-use/extend existing RDB**

IRMIS approach

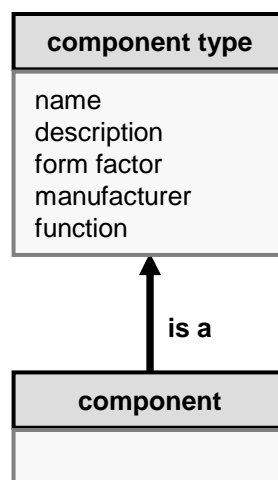
- Minimize the abstraction/modeling in the definition of ‘components’
- Thus, instead of assigning a ‘behavior’ to a magnet (“sextupole corrector in the LEBT”), in IRMIS a magnet is simply a component that converts an DC electric current into a magnetic field. *(It is characterized by the number of ports it has, rather than what it does to the beam.)*
- The goal is to have component definitions that are universal in nature.
- "Make everything as simple as possible, but not simpler."



IRMIS Components

- **What is a component?**
 - “a constituent element, as of a system”... (Google)
 - components are obtained by successively **partitioning** the system/facility until you reach:
 - *unit replaceable physical entities associated with the accelerator*
 - IO card, chassis, serial link, rack, ...
 - *these (COTS) components are the same building blocks used in building any facility*
 - components have a more primitive granularity than a ‘device’
 - *do not assign a high-level physics ‘role’ to a component*
 - *less subjective – no naming convention issue*
 - more on this later
 - more geared to how the facility is **assembled**, rather than how it **functions**

IRMIS Component Types

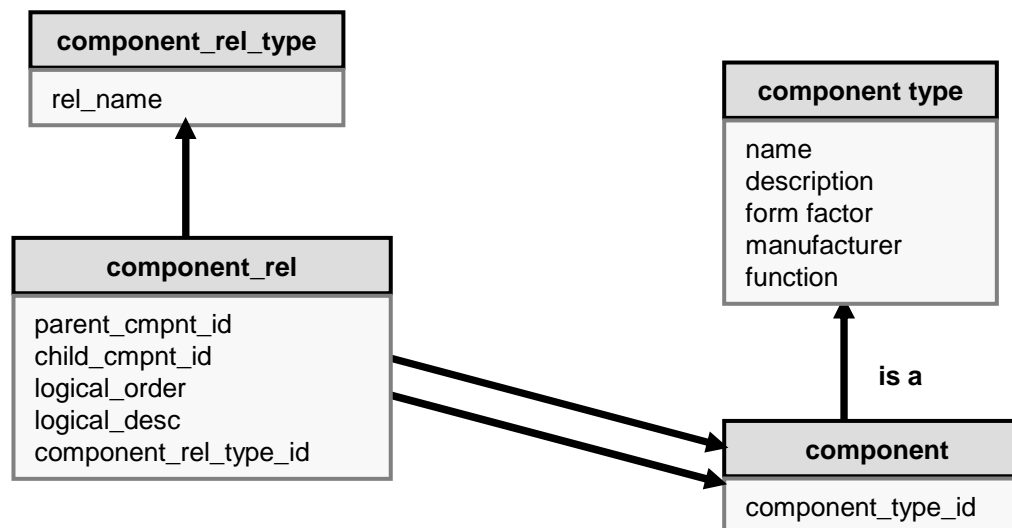


A component is of a particular component type. The component type attributes shown are of a totally general nature (no site specific attributes). There is no 'role' assigned to component instances.

There is no component sub-typing in the schema. A single table describes all component types (> 800 types are required to build and assemble the APS!).

Component Connections

- Listing component instances is of limited use.
- The IRMIS schema relates components by how they are interconnected:
 - physically (housing hierarchy)
 - logically (control hierarchy)
 - power grid (power hierarchy)
- Each relationship type is hierarchical in nature (each child has a unique parent in each hierarchy). The hierarchies are modeled as node/edge graphs (DAGs).



Cables

Cable Types:







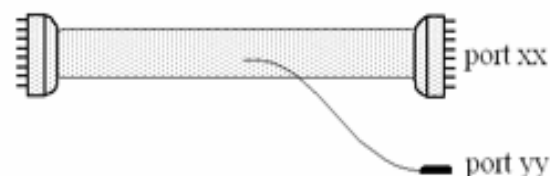
- a) single wire (no terminal lug) 
- b) single wire with connector 
- c) wire bundle (no connector) 
- d) wire bundle with connector
-- (wires may be pigtailed)
-- eg ribbon cable 
- e) single fibre (terminated) 
- f) fibre bundle 
- g) others?

Figure 1: Examples of conductors and cables.

Pathological example:

Cable bundle with an individual wire tapped out:
This cable plugs into 2 device ports!

-- the database must handle this.



Ports and Cables

